CSE 482/682: Artificial Intelligence

Richard Kelley
Fall 2015

Instructor information

• Your instructor is Richard Kelley
• His email address is rkelley@unr.edu
• Office hours by appointment, unless we come up with something better.

Course description and prerequisites

Official Course Description: Problem solving, search, and game trees. Knowledge representation, inference, and rule-based systems. Semantic networks, frames, and planning. Introduction to machine learning, neural-nets, and genetic algorithms. (Formerly CS 476; implemented Spring 2005.)

Prerequisite(s): CS 365.

Richard’s Description: This course will cover the fundamental principles that allow intelligent systems to operate in the world.

List of recommended course materials

There will be no required textbook. Most of the course material will come from iPython notebooks and lectures. There are a few recommended textbooks. Reading the following would put you close to the state of the art in AI. Each one could serve as the basis of an entire course; we will focus on material from the first and last ones.

Recommended Textbooks:

• Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig. The textbook website is http://aima.cs.berkeley.edu/. This is actually one of the best textbooks in Computer Science. It gives a great introduction to the field, and is a great reference.

• Machine Learning: A Probabilistic Perspective by Kevin Murphy. Machine Learning is at the heart of modern AI, and this book covers most of the topics in modern machine learning. Comes with lots of Matlab code that you can work through yourself.

• Probabilistic Graphical Models by Daphne Koller and Nir Friedman. PGMs are another major topic of current interest in AI. This book is the comprehensive reference on the problem of combining structure and uncertainty.

• Convex Optimization by Stephen Boyd and Lieven Vandenberghe. Underlying just about all of modern AI is the theory of optimization. This book is a good introduction to the kind of optimization that is widely used in AI.
• *Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp* by Peter Norvig. This book is one of the best overviews of “classical” topics in AI. As the title suggests, it also covers a lot of Lisp programming technique, which would probably be healthly to learn a bit about.

**Topics outline**

Tentatively, here’s what we’re going to cover:

- **Python**
  - Virtual environments & Pip
  - IPython Notebooks
  - Basic concepts
  - Numpy

- **Basic Mathematics**
  - Linear Algebra
  - Probability, Statistics, and Information
  - Discrete Optimization
  - Continuous Optimization

- **Machine Learning**
  - Types of problems
  - Unsupervised Learning
  - Supervised Learning
  - Comparing systems
  - Diagnosis & Visualization
  - K-means
  - Linear regression
  - Logistic regression
  - Feedforward Neural Networks & Backpropagation

- **Search (Deterministic Shortest Path Problems)**
  - Problem Formulation
  - Tree Search & Graph Search
  - A* Search
  - Beam Search

- **Adversarial Search**
  - Minimax Search
  - $\alpha-\beta$ pruning

- **Constraint Satisfaction**
  - Constraint Satisfaction Problems
  - Backtracking
  - Local Search
• Logic
  – Propositional Logic
  – Normal forms
  – Inference algorithms

• Applications
  – Natural Language Processing: Lexical Semantics
  – Robotics: Probabilistic Roadmaps
  – Computer Vision: Object Recognition

Approximate schedule of exams

There will be one exam after the machine learning portion of the course. This exam will test your comprehension of the mathematical details covered in lectures and programming assignments.

Grading

Your grade will be determined by your performance in class, on the exam, and on a semester project. The percentage breakdown is:

• 35% In-class coding assignments
• 15% Exam
• 50% Final project

Additionally, graduate students will be required to write weekly reports on assigned papers.

Statement on Academic Dishonesty

Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student’s enrollment without a grade, giving an F for the course or for the assignment. For more details, see the University of Nevada, Reno General Catalog.

Statement of Disability Services

Any student with a disability needing academic adjustments or accommodations is requested to speak with the Disability Resource Center (Thompson Building, Suite 101) as soon as possible to arrange for appropriate accommodations.

Statement on Audio and Video Recording

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.
Statement for Academic Success Services

Your student fees cover usage of the Math Center (775) 784-4422, Tutoring Center (775) 784-6801, and University Writing Center (775) 784-6030. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.